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Bird use of restored wetlands on Conservation Reserve Program land

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Abstract
From a conservation standpoint, the establishment of the Conservation Reserve Program (CRP) was one of the most significant aspects of the 1985 Food Security Act. Although most of the highly erodible land set aside for ten years in CRP is planted to various upland plants, wetlands are an accepted land use under the program. Because wetlands are one of the most endangered wildlife habitats in North America, and in Iowa in particular, this provision of CRP substantially enhances its value as a conservation program. Nationwide, about 53% of wetlands have been lost; in Iowa more than 90% have been drained for agricultural use. In the north-central states, wetland loss has seriously reduced populations of waterfowl and numerous nongame wildlife species, including birds, insects, and plants.

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Bird use of restored wetlands on Conservation Reserve Program land

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Budget
$11,440 for year one
$9,600 for year two

Background

From a conservation standpoint, the establishment of the Conservation Reserve Program (CRP) was one of the most significant aspects of the 1985 Food Security Act. Although most of the highly erodible land set aside for ten years in CRP is planted to various upland plants, wetlands are an accepted land use under the program. Because wetlands are one of the most endangered wildlife habitats in North America, and in Iowa in particular, this provision of CRP substantially enhances its value as a conservation program. Nationwide, about 53% of wetlands have been lost; in Iowa more than 90% have been drained for agricultural use. In the north-central states, wetland loss has seriously reduced populations of waterfowl and numerous nongame wildlife species, including birds, insects, and plants.

Because a significant portion of North America's birds depend on wetlands for part of their life cycle, major efforts have been launched in the past eight years, both by governments (the United States and Canada) and by private individuals, to preserve existing wetlands and restore wetland conditions where they existed prior to drainage. Wetland restoration has proven popular, particularly on CRP land. Iowa has more recently intensified its restoration efforts, especially in north-central Iowa, the site of tens of thousands of natural shallow basins that once were wetlands.

Despite this broad interest in wetland restoration, little has been done to evaluate how wetland restoration affects wildlife. As efforts to restore wetlands progress, it is critical that restored wetlands be evaluated in terms of their ability to provide habitat for various bird species so that future restoration efforts can be appropriately directed. If CRP is to continue to function in a conservation role, it is important to quantify all of its potential benefits. With such knowledge, landowners, policymakers, and the general public can make better land use decisions.

The specific objectives of this project were to
(1) evaluate restored wetlands on CRP land as nesting, feeding, and brood-rearing habitat for wetland birds;
(2) determine how size, isolation, and age of restored wetlands affect their colonization by wetland birds (age was emphasized because wetland study sites did not provide an adequate sample that met conditions of all three variables); and
(3) develop strategies to maximize wildlife benefits from wetland restoration.

Approach and methods

Investigators studied 16 restored wetlands in 1991 and 24 in 1992. Sites ranged from one to four years post-restoration and from 0.4 to 5.9 hectares (1 to 14.5 acres) in size. Located in Clay, Dickinson, Emmet, Kossuth, and Palo Alto counties, all wetlands had been drained completely prior to restoration, were formerly tile drained and row-cropped, and were surrounded by uplands planted in grasses and broadleafed plants typical of land in CRP. Aerial photographs of all sites were taken yearly and mapped to measure wetland area. Land-use and restoration history information was obtained via landowner surveys and from the Iowa Department of Natural Resources.

Breeding bird community composition: Investigators established three census stations spaced consistently in each wetland, in the middle of the emergent vegetation zone or at the water's edge if no emergent vegetation was present. Birds were censused to determine bird use and breeding species on each wetland five times yearly between May and July in both years. Censuses were scheduled for optimal times and weather conditions, and bird-call tapes were played to elicit responses from more secretive species. Wetlands were searched for nests weekly in 1991 and bi-weekly in 1992. Investigators also ground-searched the emergent vegetation zone and 30 meters (32.8 yards) of the surrounding upland by foot, scanning the vegetation for nests and flushing birds. If, for a given species, an active nest was found, brood were seen, or presence was noted in three of the five visits, that species was regarded as breeding.

Spring waterfowl counts: In spring 1992 and 1993, a sample of restored wetlands was visited weekly and all waterfowl present were counted. In 1992, 11 wetlands were visited 11 times each from March 7 to May 17. In 1993, nine wetlands were visited eight times each from March 23 to May 8.

Invertebrates: Sixteen wetlands, five in 1991 and 11 in 1992, of four age categories (one, two, three, or four years) were sampled for invertebrates. Wetlands were sampled twice yearly—during the first and third weeks in June. Three sampling zones—emergent, submergent, and open water—were established in each wetland. A total of 18 sampling stations were established in each wetland at random locations.

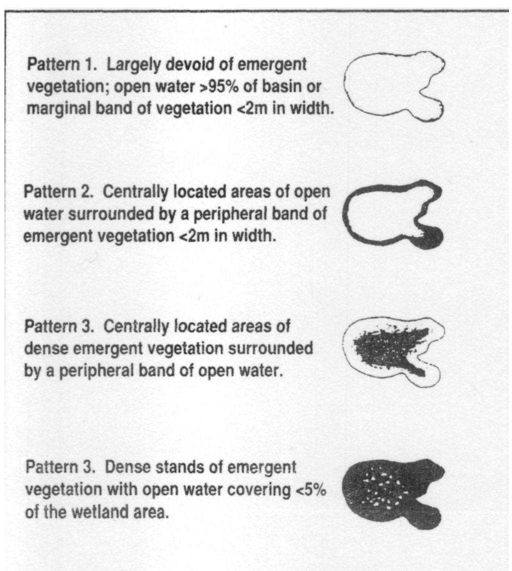

Fig. 1. Vegetation patterns in restored wetlands. White areas indicate open water; shaded areas indicate emergent vegetation.

The differences between various invertebrate life stages prompted investigators to use three sampling methods: (1) benthic (bottom-dwelling) invertebrates were counted with a core sampler at a depth of 5 cm (2 inches); (2) activity traps made of plastic soda bottles were used to sample free-swimming invertebrates; and (3) macroinvertebrates attached to the vegetation surface were collected from the three dominant plant species within each marsh; five of each were cut, bagged, and returned to the laboratory. Invertebrates were classified either as overwintering residents, overwintering spring recruits, overwintering summer recruits, or non-wintering spring recruits. They were further categorized as parasites, collectors, shredders, scrapers, or predators.

Vegetation: In mid-July, investigators assessed the vegetation community of each wetland. They visually estimated the *zonation* (buffer, mudflat, wet meadow, emergent or open water), *dispersion* (large pure stands, small colonies, small patches, clumps or dense groups, or solitary), and *percent cover* (< 1 %, 1-5%, 6-29%, 30-50%, 51-75%, and >75%). They drew a detailed cover map for each basin and then estimated visually the total percent emergent cover. Basins were also classified according to vegetation pattern (see Fig. 1).

Statistical analysis: The number of breeding species, number of breeding waterfowl species, total species richness, and waterfowl species richness among wetlands of various ages were compared. Because of interaction among the variables, the statistical analysis was performed conservatively, yielding conclusions that while valid, cannot be used for making predictions.

Findings

A wide variety of bird species use restored Iowa wetlands. The plant and invertebrate communities provided the food and cover necessary to attract a broad range of birds to these restored wetlands, both during the breeding season and during migration. During the breeding season, 42 bird species were found on restored wetlands, 14 of which were waterfowl (see Table 1). Waterfowl use of restored wetlands was even greater during migration, when 21 species of waterfowl used these wetlands (see Table 2); this included nearly all of the species normally expected to be found here during spring.

The 15 breeding species found in the four-year wetlands include virtually all of the species that normally nest on wetlands of this size in northern Iowa. While this is fewer than the average number found on similar-sized natural wetlands in this region, it is more than the number of breeding species found in the one- to three-year-old restored wetlands.

Of equal importance is the finding that the number of species breeding on these wetlands increased with wetland age and after four years was similar to the number of species found on natural, undrained wetlands. Thus, within a few years, these marshes attract and support a variety of breeding species that is close to that found on natural wetlands.

In contrast, although breeding waterfowl colonized these wetlands soon after restoration, their diversity did not increase with wetland age. This finding was not surprising because waterfowl tend to use areas as soon as water is available. Because waterfowl nest on the uplands surrounding a wetland, the quantity and quality of upland vegetation and presence of an invertebrate food source may be more important than the development of vegetation on the wetland in terms of encouraging waterfowl use.

A few species that use the "younger" wetlands but not the older ones included some waterfowl and sandpipers, probably because of the availability of mudflats and open water in the younger wetlands. Species such as bitterns, one grebe, the Marsh Wren, and Black-crowned Night-Heron were present at more of the older wetlands, probably in response to increased emergent vegetation. Thus, although overall species richness did not differ with wetland age, the composition of the bird communities did change with wetland age.

Overall, investigators found that both plant and animal communities developed very rapidly on restored wetlands. The vegetation community developed with virtually no outside management. The seed bank existing in the soil along with the natural dispersal of seeds were the probable sources of these plants; none were artificially planted or seeded. By the age of three years, many of the wetlands had developed complex communities with several distinct vegetation zones and good stands of emergent vegetation that resembled those of natural wetlands. The one missing component was the wet-meadow zone; it may take special management to restore that community. One-year-old wetlands were mostly devoid of vegetation or had sparse stands of cattails. Submergent vegetation was found in 58% of one-year-old wetlands; this vegetation

Table 1. Bird species richness and nesting species found in restored Iowa wetlands, 1991 and 1992.

	Total species	Nesting species
Waterfowl	14	4
Herons and bittern	7	2
Grebes and coot	2	2
Rails	2	2
Shorebirds	10	0
Terns	2	0
Songbirds	5	5
Total species	42	15

Table 2. Waterfowl found using restored wetlands in spring 1992 and 1993. Total number of birds counted and number of wetlands used is given for each species. Eleven wetlands were surveyed in 1992 and nine in 1993.

	1992		1993	
Species	# birds	# wetlands	# birds	# wetlands
Trumpeter Swan	2	1	0	0
Snow Goose	12	1	0	0
Canada Goose	385	9	220	9
Wood Duck	18	5	9	4
Green-winged Teal	755	11	14	2
American Black Duck	1	1	0	0
Mallard	2198	11	202	9
Northern Pintail	46	4	4	2
Blue-winged Teal	1117	11	248	9
Northern Shoveler	386	11	71	7
Gadwall	538	10	23	3
American Wigeon	481	8	16	3
Canvasback	29	2	12	2
Redhead	78	5	68	5
Ring-necked Duck	445	9	212	5
Lesser Scaup	700	10	162	6
Common Goldeneye	46	1	7	2
Bufflehead	68	6	72	5
Hooded Merganser	3	1	25	3
Common Merganser	8	1	6	2
American Coot	80	6	256	7
total birds	**7,396**		**1,627**	

may account for waterfowl use of these basins, because many waterfowl feed either on these plants or the invertebrates that eat those plants.

In similar fashion, invertebrates rapidly invaded these restored wetlands; even in the first year after restoration, investigators could not detect differences in the overall makeup of these communities as compared to those of natural wetlands. The total number of invertebrate taxa did not differ with restored wetland age, nor did the number of taxa in most groups of invertebrates. The only group to differ significantly was Hemiptera (an order of insects classified as true bugs), which were fewer in number in the one-year-old wetlands. This finding is significant because many of these invertebrate taxa are known to be important in the feeding ecology of breeding, juvenile, and post-breeding waterfowl. Only mosquitoes and caddisflies were not found in a high proportion of the restored wetlands studied; this lack may be attributable to the sampling method used, particularly for the mosquitoes. But overall, even in the first year after restoration, restored wetlands contain most of the invertebrates important in waterfowl nutrition.

In short, in a period of four or five years, these restored wetlands have changed from typical row-cropped land to a highly productive wetland with a bird community similar in complexity to that of natural wetlands.

Implications

These results indicate that productive wetlands having high breeding bird diversity take several years to develop. By age four, these wetlands are approaching the complexity of natural wetlands. Thus, in terms of wildlife, one of the main benefits of CRP is its 10-year duration. This length of time allows landowners to establish wetlands that will have sufficient time to develop plant and invertebrate communities that in turn attract a broad variety of breeding bird species. *Annual or two-year conservation programs are too brief for these communities to develop, and thus they are of little value in terms of attracting and supporting a diverse community of breeding birds.*

If wetlands are restored simply to provide a breeding site for waterfowl, a short-term program can accomplish this goal. Simply providing a wetland with good cover around it seems sufficient to attract breeding waterfowl. However, such short-term programs have two drawbacks: (1) Although the number of breeding waterfowl species did not change with age, the species composition did change. During the first two years after restoration, virtually all of the nesting waterfowl were Canada Geese, Mallard, or Blue-winged Teal. Other nesting species, including several that nest over water, did not appear until a good stand of emergent vegetation had developed, typically by the third or fourth year. Thus a short-term program would not provide habitat for these species. (2) In addition, changes were also found in the species composition of the total bird community. Along with the increase in variety of species with wetland age, investigators found several species that were missing in younger restored wetlands but were present in older ones.

Investigators also found evidence that even some of the smaller wetlands were attractive to a wide variety of species, especially if they were placed close to natural wetlands or other restorations. Grouping is important to encourage productivity in natural wetlands, and the same is likely true for restored wetlands. To maximize wildlife benefits, future restorations should be located near other restored or natural wetlands. In fact, this would be a desirable criterion for evaluating applications for CRP renewal or future conservation programs.

Investigators reported observing a clear sense of pride and accomplishment among the landowners cooperating in this project. Permission was granted readily, and landowners expressed interest in the results. Many indicated that they enjoyed watching the birds and other wildlife on these ponds, and that they were glad that they had restored the wetlands. This anecdotal evidence constitutes a less quantifiable but nevertheless clear benefit of the CRP.

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